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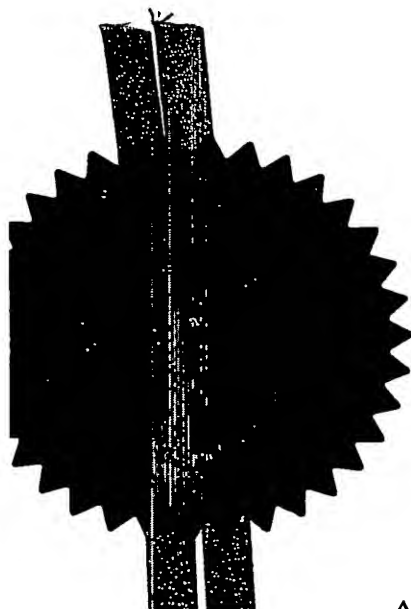
GB/03/4885

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

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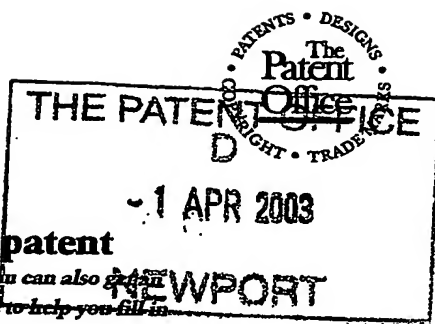
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Signed *Andrew Gurney*
Dated 25 November 2003

Patent 1977
(Rule 1)



01APR03 E796830-1 D02819
F01/7700 0.00-0307512.4

Request for grant of a patent

(See the notes on the back of this form. You can also obtain an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road
Newport
South Wales
NP10 8QQ

1. Your reference

C687/W

2. Patent application number

(The Patent Office will fill in this part)

0307512.4

01 APR 2003

3. Full name, address and postcode of the or of each applicant (underline all surnames)

UNOVA (U.K.) Limited
26 Temple Street
Aylesbury
Buckinghamshire
HP20 2RQ

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

8601957001
England

4. Title of the invention

Workpiece cooling during grinding

5. Name of your agent (if you have one)

Keith W Nash & Co

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

90-92 Regent Street
Cambridge
CB2 1DP

Patents ADP number (if you know it)

1206001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application number
(if you know it)

Date of filing
(day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing
(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

Yes

- a) any applicant named in part 3 is not an inventor, or
 - b) there is an inventor who is not named as an applicant, or
 - c) any named applicant is a corporate body.
- See note (d))

Patents Form 1/77

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form

Description

2

Claim(s)

Abstract

Drawing(s)

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (Patents Form 7/77)

Request for preliminary examination and search (Patents Form 9/77)

Request for substantive examination (Patents Form 10/77)

Any other documents (please specify)

11.

I/We request the grant of a patent on the basis of this application.

Signature

Date 31/03/03

Keith W Nash & Co., Agents

12. Name and daytime telephone number of person to contact in the United Kingdom

Keith Nash 01223 355477

Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

Notes

- a) If you need help to fill in this form or you have any questions, please contact the Patent Office on 08459 500505.
- b) Write your answers in capital letters using black ink or you may type them.
- c) If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.
- d) If you have answered 'Yes' Patents Form 7/77 will need to be filed.
- e) Once you have filled in the form you must remember to sign and date it.
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C687/W

Title: Workpiece cooling during grinding

Field of invention

This invention concerns methods and apparatus for grinding, especially grinding the edges of glass plates, and in particular cooling the glass and grinding wheel during the grinding process.

Background to the invention

It is known to use water based liquids or coolants during grinding, but such liquids have a disadvantage in that the water has been found to mark the glass surface which can be difficult to remove.

It is an object of the present invention to provide a method of cooling and a coolant and apparatus for delivering same, which will not mark the glass.

Summary of the invention

According to one aspect of the invention there is provided a method of cooling during grinding in which liquid nitrogen is applied to the contact region between wheel and workpiece.

According to another aspect of the invention there is provided apparatus for supplying liquid nitrogen as a coolant for carrying away heat during the grinding of a rotating workpiece by a rotating grinding wheel.

The invention is of particular application to the grinding of the edge of a glass workpiece in which the liquid nitrogen is directed towards the edge of the glass or the wheel or into the nip between the rotating workpiece and the rotating grinding wheel.

The invention also lies in a grinding machine when fitted with such apparatus.

Thus a grinding machine embodying the invention includes a workpiece support, drive means for rotating the support, a grinding wheel and drive means therefor, and apparatus for carrying away heat during the grinding of the workpiece by the grinding wheel when engaged therewith, the apparatus comprising a source of liquid nitrogen under pressure, valve means for controlling the supply of liquid nitrogen therefrom to nozzle means, and support means adapted to adjustably support the nozzle means in the vicinity of the grinding wheel so as to direct liquid nitrogen towards the point of contact between the wheel and a workpiece when the valve means is opened.

Preferably the grinding machine is computer controlled and the control system is programmed to deliver liquid nitrogen coolant to the nozzle when the wheel is rotating and is in grinding contact with the workpiece, and to stop the delivery of the coolant after grinding is completed.

The valve means may include pressure reducing means.

The source may be a pressure vessel and pressure sensing means may be provided for generating a warning signal if the pressure in the vessel drops below a predetermined pressure, which is preferably selected such that there is sufficient liquid nitrogen remaining in the vessel at that pressure, as to ensure that the grinding of a workpiece can be completed before the source is exhausted, and an interlock may be provided to prevent resumption of grinding unless the source is replaced or replenished.

THE PATENT OFFICE

03 DEC 2003

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